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A New Subspecies of *Prioneris autothisbe* (HÜBNER) (Lepidoptera, Pieridae) from Bali, Indonesia

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Abstract A new subspecies of *Prioneris autothisbe* is described from Bali, Indonesia and its habitat and habits are also reported in relation to those of *Delias* species. It is characterized by the narrow black distal border of its hindwing upperside and the orange ground colour of its hindwing underside.

Key words: Pieridae; *Prioneris*; *autothisbe*; mimicry; Bali; Indonesia.

Prioneris autothisbe (HÜBNER, 1816) which is endemic to Jawa and Bali shows remarkable geographical variation in Jawa, and was divided into two good subspecies: *autothisbe* (HÜBNER, 1816) from West Jawa, and *orientalis* (FRUHSTORFER, 1903) from East Jawa. KALIS (1941) recorded *P. autothisbe* from Bali for the first time, and SAKUMA (1987) also reported two specimens of the present species collected from central highland of the Island. However, they did not describe as distinct subspecies because of lack of sufficient material. We conclude that the population from Bali does represent a new subspecies based on materials from E. Jawa and Bali. In the present paper we describe the new taxon and discuss its variation in relation to that of *Delias* species.

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Abbreviations of the type depositories are as follows:

KMNH: Kitakyushu Museum of Natural History, Kitakyushu.

KUCGE: Kyushu University, College of General Education, Fukuoka.

MK: M. KAWAI collection, Tokyo.

MZB: Museum Zoologi Bogor, Bogor.

SM: S. MORINAKA collection, Saitama.

Prioneris autothisbe tamblingana MORINAKA et YATA, ssp. nov.

(Figs. 1–6)

Male. Upperside: Forewing ground colour white, with veins black dusted; costal to distal border and apical half black, containing cell end; post-discal white spots in spaces 5 and 9 distinct, but almost disappearing in space 6; subapical and submarginal white spots in spaces 4 to 6 and 9 distinct, sometimes confluent with white ground colour in space 3; costal margin serrate. Hindwing ground colour white, somewhat translucent; black distal border bordered from tornus to space 7, with its inner edge somewhat obscure, projected along each vein from spaces 1b+c to 3. Underside: Forewing as on upperside, but post-discal, subapical, and submarginal white spots are somewhat larger; cell black dusted basally. Hindwing ground colour orange with veins blackened; basal portions of cell and space 7 with reddish spots, the latter markedly black bordered along veins 7 and 8; black distal border bordered from tornus to space 7; a series of submarginal orange spots sometimes indistinct in spaces 1b+c to 3.

Female. Similar to male, but differing as follows. Upperside: In forewing, black costal to distal border broader; post-discal white spots in space 5 and 9 fainter, while subapical and submarginal white spots are larger and more prominent; basal 1/3 of forewing black dusted; veins more heavily black dusted. Hindwing black distal border broader, with a series of submarginal white spots in spaces 2 to 6. Underside: In forewing, black costal to distal border broader; post-discal white spots fainter, while subapical and submarginal white spots are larger and more prominent; basal 1/3 of forewing densely black dusted. Hindwing with a series of submarginal orange spots much larger and rounder.

Forewing costal margin not serrate; forewing apex and outer margin somewhat rounder.

Variation: In this paper we treat the specimens from C. Jawa as ssp. *autothisbe* based on their wing markings. This species shows remarkable variation, especially in E. Jawa (Mt. Argopuro and Mts. Ijen). The subspecies *tamblingana* varies a little, based on the eight males (e.g. one male shows paler orange on hindwing underside) and the four females (e.g. one female shows wing markings on the forewing upperside similar to male except broader costal to distal border and the ground colour on the hindwing underside black dusted) examined here.

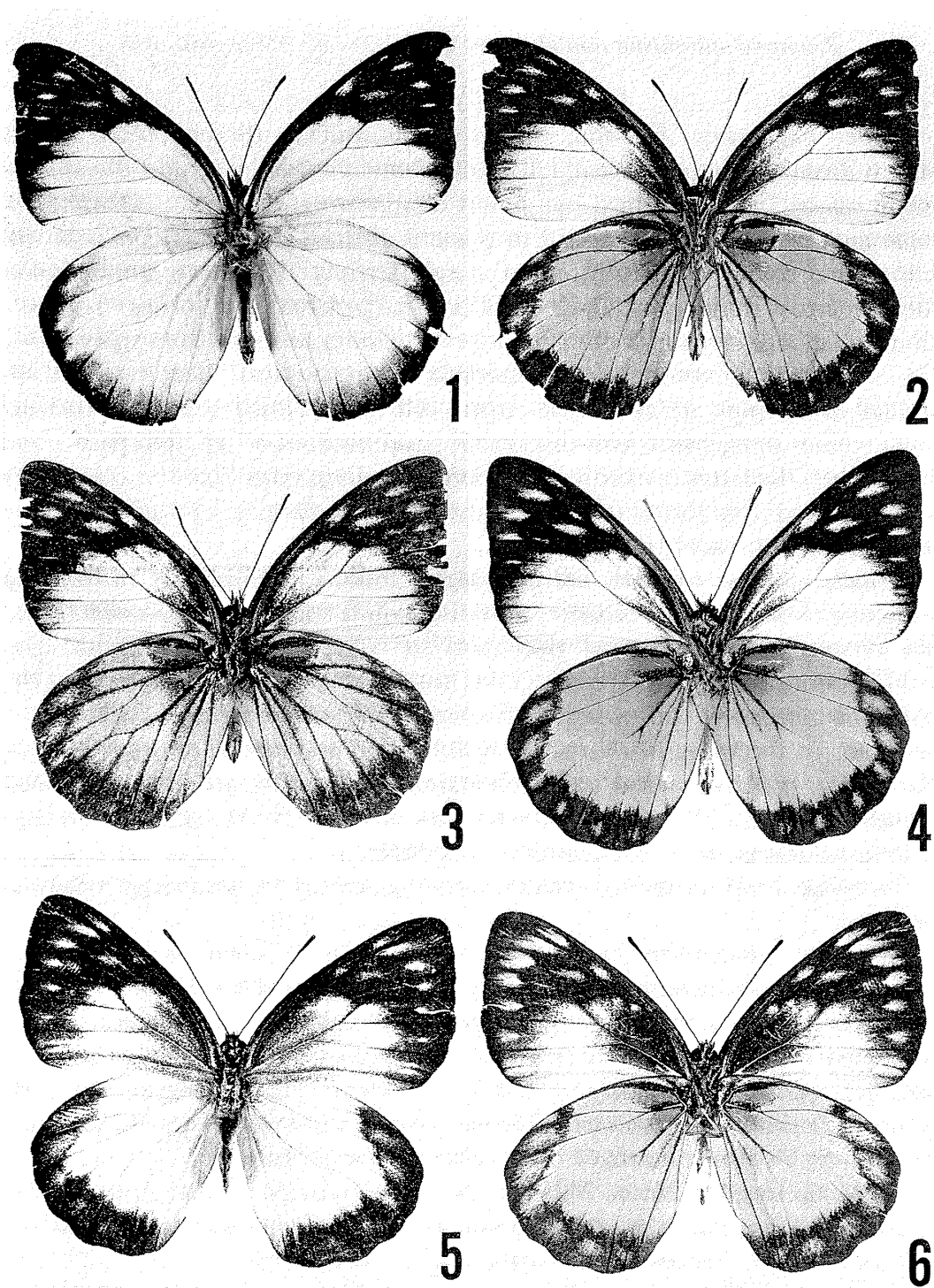
Forewing length: Male, 34.0–36.1 mm ($n=8$, $\bar{x}=34.9$ mm); female, 31.3–36.0 mm ($n=4$, $\bar{x}=35.1$ mm, excluding abnormally small one of females about \bar{x}).

Type locality: Indonesia, Bali, around Lake Tamblingan.

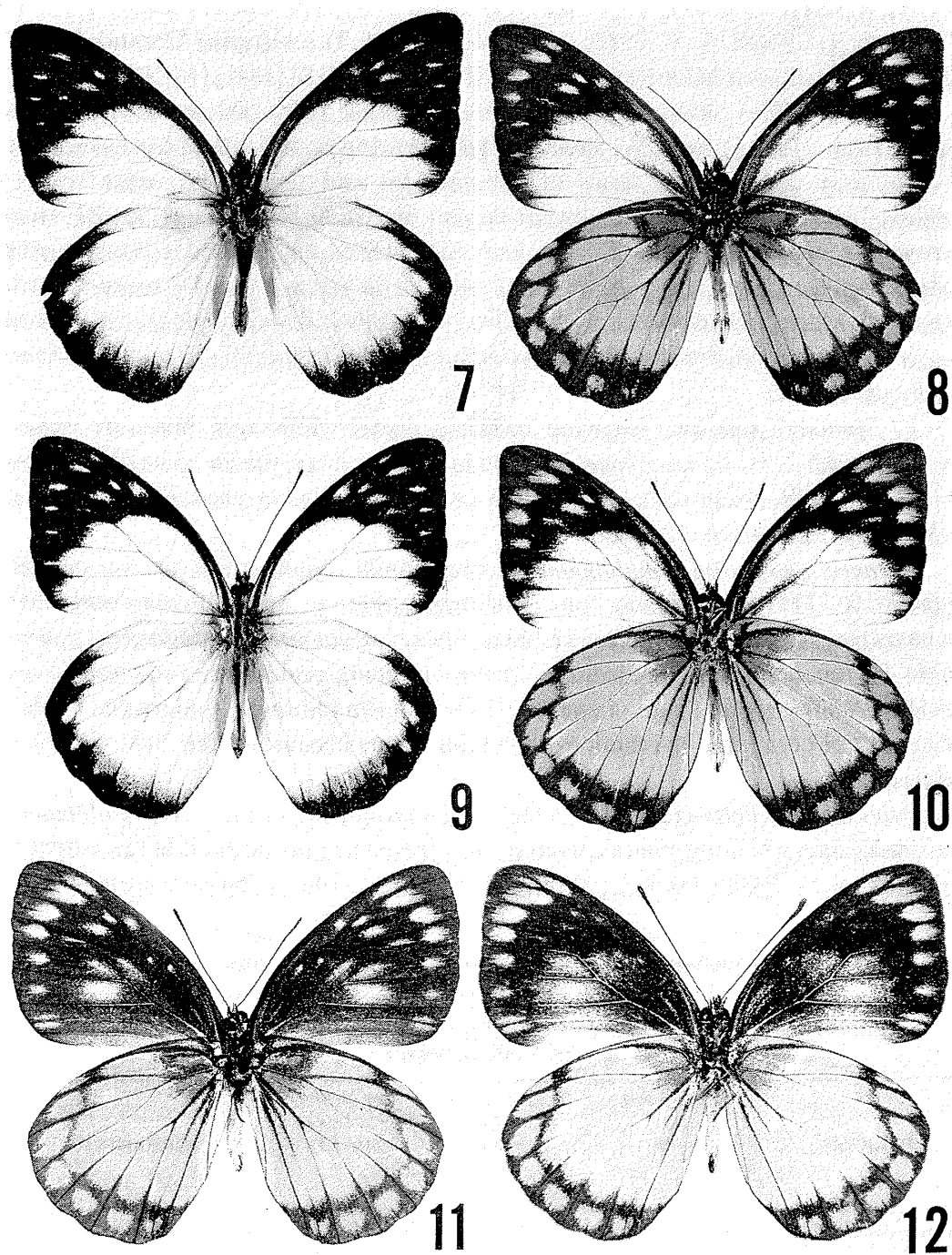
Geographical distribution: Known only from Bali.

Holotype: ♂, around Lake Tamblingan, Central Bali, 28. IV. 1986, Sadaharu MORINAKA leg. (Holotype in KUCGE)

Paratypes: 2 ♂, same as holotype, Sadaharu MORINAKA leg.: 1 ♂, Bali, 3. V. 1988; 1 ♂, Bali, 6. V. 1988; 1 ♂, Bedugul, Bali, 29. VIII. 1989; 1 ♂, Bali, VIII.



Figs. 1–6. *Prioneris autothisbe tamblingana* ssp. nov. — 1, Holotype ♂, around Lake Tamblingan, C. Bali, Sadaharu MORINAKA leg.; 2, ditto, underside; 3, Paratype ♂, same as holotype, Sadaharu MORINAKA leg.; 4, Paratype ♂, Bali; 5, Paratype ♀, Bali; 6, ditto, underside.



Figs. 7-12. *Prioneris* spp. 7-8, 11. *Prioneris autothisbe autothisbe*. — 7, ♂, Mt. Gede, W. Jawa; 8, ditto, underside; 11, ♀, C. Jawa. 9-10, 12. *Prioneris autothisbe orientalis*. — 9, ♂, Mt. Ijen. E. Jawa; 10, ditto, underside; 12, ♀, E. Jawa.

1989 (KMNHIR 200,067); 1 ♂, Bali, VI. 1990; 1 ♀, Bali, 24. IV. 1988; 1 ♀, Bali, 3. V. 1988; 1 ♀, Bali, 4. V. 1988; 1 ♀, around Lake Tamblingan, Central Bali, 28. VIII. 1993, Sadaharu MORINAKA leg. [KMNH] [KUCGE] [MK] [MZB] [SM].

Remarks. This new subspecies is distinguishable from the nominotypical subspecies (Figs. 7–8, 11) from W. Jawa by the following combination of characters:

On male upperside, a series of submarginal and post-discal white spots on forewing black distal border somewhat larger; hindwing black distal border usually narrower in spaces 1b+c to 3. On underside, hindwing ground colour orange, while in ssp. *autothisbe* it is yellow; basal red spot in space 7 usually more narrowly edged with black, and not entirely bordered with black distally; black distal border usually somewhat narrower and a series of submarginal spots in spaces 1b to 4 more weakly developed.

On female upperside, forewing basal to discal white area broader, while in ssp. *autothisbe* it is almost black; hindwing black distal border usually narrower. On underside, forewing discal white area broader, hindwing ground colour orange while in ssp. *autothisbe* it is yellow.

Prioneris autothisbe tamblingana is occasionally quite similar to ssp. *orientalis* (Figs. 9–10, 12) from E. Jawa, but is distinguishable by the following combination of characters in male: the narrower black distal border on the hindwing upperside (Table 1), the orange ground colour on the hindwing underside, and more weakly developed submarginal spots in spaces 1b to 4 on the hindwing underside (Table 1). We could not compare the female with similar forms because of the lack of sufficient material.

Habitat and habits (Fig. 13). One of us (MORINAKA) observed *tamblingana* at the forest edge, or along paths through the forest in high mountains (around Lake Tamblingan, C. Bali, about 1,100 m alt.) in April, 1986. The subspecies was ob-

Table 1. Comparison of the size of submarginal spot in space 3 on hindwing underside and of the width of black distal border on hindwing upperside between *Prioneris autothisbe tamblingana*, *P. a. orientalis* and *P. a. autothisbe*.

Characters	<i>tamblingana</i> (Bali) (n=6)	<i>orientalis</i> (E. Jawa) (n=34)	<i>autothisbe</i> (W. Jawa) (n=13)	Comparison
	Mean±S.D.			
Black distal border ¹⁾	9.43± 0.97	12.79± 1.90	14.74± 1.51	<i>tamblingana</i> < <i>orientalis</i> *** <i>tamblingana</i> < <i>autothisbe</i> ***
Submarginal spot in space 3 ²⁾	25.68±12.39	44.64±13.10	43.06±10.66	<i>tamblingana</i> < <i>orientalis</i> *** <i>tamblingana</i> < <i>autothisbe</i> ***

1) Percentage of the Width of black distal border along vein 3 on upperside hindwing to the length of hindwing. 2) Percentage of the width (in the axis of apex-tornus) of submarginal spot in space 3 on underside hindwing to the length of Cu veinlet between the origins of veins 3 and 4 (proximal margin of space 3). *** Significant ($P<0.01$) by *t*-test.



Fig. 13. Habitat of *P. autothisbe tamblingana* in Lake Tamblingan, C. Bali (1,100 m in alt.).

served imbibing nectar from the flower of *Lantana*, together with *Delias oraia bratana* KALIS, 1941, but was less abundant and swifter flying than *bratana* (a possible model for mimicry by *tamblingana*).

Etymology. The subspecific name, *tamblingana*, is derived from the name of type locality (Lake Tamblingan).

Discussion

Prioneris autothisbe orientalis from E. Jawa shows remarkable variation in the ground colour on the hindwing underside. Of 239 males examined, 31.8% are blackish (f. *mucida* FRUHSTORFER, 1911), 35.1% whitish (f. *albifera* FRUHSTORFER, 1911), 11.3% orange, 4.2% yellow (similar to *autothisbe*) and 17.6% pale orange or pale yellow ground colour. The specimens with orange ground colour are very similar to *tamblingana*, although they can be distinguished from the latter in having a broader black distal border on the hindwing upperside and larger submarginal spots on the hindwing underside (Table 1). Conversely subspp. *autothisbe* and *tamblingana* exhibit almost no variation. In *autothisbe*, of 15 males examined, only one male shows variation (pale yellow ground colour and black distal border fairly developed on the hindwing underside), while the others are normally marked. With regard to females, remarkable variations are noted also in *orientalis*, while no variation is seen among four *tamblingana* females except one black dusted female. In the nominotypical subspecies, though we examined specimens only from Central Jawa and figures by YATA (1981) and by D'ABRERA (1982), their wing markings are almost identical. It seems that the variation of wing markings occurs almost only in *orientalis*.

Pattern of geographical variation in *P. autothisbe* can similarly be observed in *Delias belisama* (CRAMER, [1782]). In *D. belisama nakura* GROSE-SMITH & KIRBY,

1889 from E. Jawa many 'forms' have been described. *Prioneris autothisbe orientalis* flies together with *D. belisama nakura*, *D. aurantia* DOHERTY, 1891 (which was separated from *D. belisama* as a good species), and partly *D. critoe* (BOISDUVAL, 1836). Conversely *D. belisama belisama* from W. Jawa, which occurs sympatrically with *P. autothisbe autothisbe*, shows little variation and further *D. aurantia* has not been distributed in W. Jawa. *Delias oraia bratana* flies together mainly with *P. autothisbe tamblingana* in Bali, and exhibits little variation. *Delias* butterflies have generally been believed to be aposematic since FINN (1897) demonstrated that *Delias eucharis* (DRURY, [1773]) is unpalatable (CORBET & PENDLEBURY, 1956, 1978, etc.). Therefore, we consider that *Prioneris autothisbe* shares a complex mimetic association with *Delias belisama*, *D. critoe*, *D. aurantia*, *D. oraia* and others, but the black form (f. *mucida*) is not explicable from a mimetic association. It would, therefore, possibly provide a very interesting subject of future study.

Reference

- D'ABRERA, B. L., 1982. Butterflies of the Oriental Region. Part 1. xxi+224 pp. Hill House, Ferny Creek, Australia.
- CORBET, A. S., & PENDLEBURY, H. M., 1956. The Butterflies of the Malay Peninsula. (2nd ed.). 537 pp. Oliver and Boyd, London & Edinburgh.
- FINN, F., 1897. Contribution to the theory of warning colours and mimicry. IV. Experiments with various birds. *J. Asiat. Soc. Beng.*, **66**: 613-668.
- FRUHSTORFER, H., 1910. *Prioneris*. In SEITZ, A. (ed.), *Macrolepidoptera of the World*, **9**: 135-137, pl. 57.
- KALIS, J. P. A., 1941. Rhopalocera van Bali. *Ent. Med. Ned.-Indie*, **7**: 61.
- SAKUMA, S., 1987. Collecting *Prioneris autothisbe* (HÜBNER) in Bali Island. *Gekkan-Mushi, Tokyo*, (200): 41. (In Japanese.)
- YATA, O., 1981. Pieridae. In TSUKADA, E. (ed.), Butterflies of the South East Asian Islands, **2**: 398-403, pls. 84. Plapac, Tokyo. (In Japanese.)

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